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Quick Start Guide For DeviceNet

--Operating FR-A500 via FR-A5ND

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SALES OFFICE		SR No.		SHOP ORDER No.	
DISTRIBUTION					
	DATE	ENGINEER	APPROVAL	DOCUMENT No.	REVISION
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Revisions

Revision	Date	Description

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Purpose

In this quick start guide for DeviceNet, we will use A/B SLC5/03 with 1747-SDN and Mitsubishi FR-A500 with FR-A5ND on DeviceNet network. We will use PC with A/B 1770-KFD as interface to DeviceNet network. We explain in simplest way how to setup, configure, and run DeviceNet network.

For more details, please refer to various application notes and instruction manuals.

1. Definitions

You should be familiar with the following definitions and actual software programs:

- **DeviceNet Assistant** – Optional, free software program downloaded from www.ab.com \ Network Products \ DeviceNet, first hands-on graphical program to setup static network, Get familiar with various components of network, provides basic understanding of network
- **RSLinx** – Required, software program from A/B, used for communications between other PC-based software programs and A/B SLC500 modules, provides many communications drivers
- **RSNetWorx** – Required, software program from A/B, replacing DeviceNetManager, used to configure DeviceNet network
- **RSLogix500** – Required, software program from A/B, used for programming ladder logic to control A/B SLC500 CPU
- **DeviceNet Analyzer** – Optional, network snooper from SST, used to monitor network activities
- **FR-A5ND** – Required, communication option from Mitsubishi, used for FR-A500 to interface DeviceNet network
- **A500.eds** – Required, free file download from www.odva.org \ downloads \ EDS files, Electronic Data Sheet from Mitsubishi, representing FR-A500 in device database, must be Rev. 4.5 or later
- **DeviceNet University** – Optional, official training offered from ODVA, Open Device Vendor Association

Please refer to A/B instruction manuals for more explanations.

2. Tools

The following tools are required to assemble, setup, and configure network:

- **D V M** to check voltage and resistance
- **Tape measure** to check cable length
- **Screw drivers**
- **Soldering station** to tin wire leads
- **Wire cutter**
- **Wire stripper**
- **Electric tape** to cover any exposed cable connections
- **Notepad** to sketch diagrams
- **PC with Windows95 or higher**

3. Sample Projects

- RSNetWorx Project: **qsg01sdn.dnt**
- RSLogix500 Project : **qsg01df1.rss**

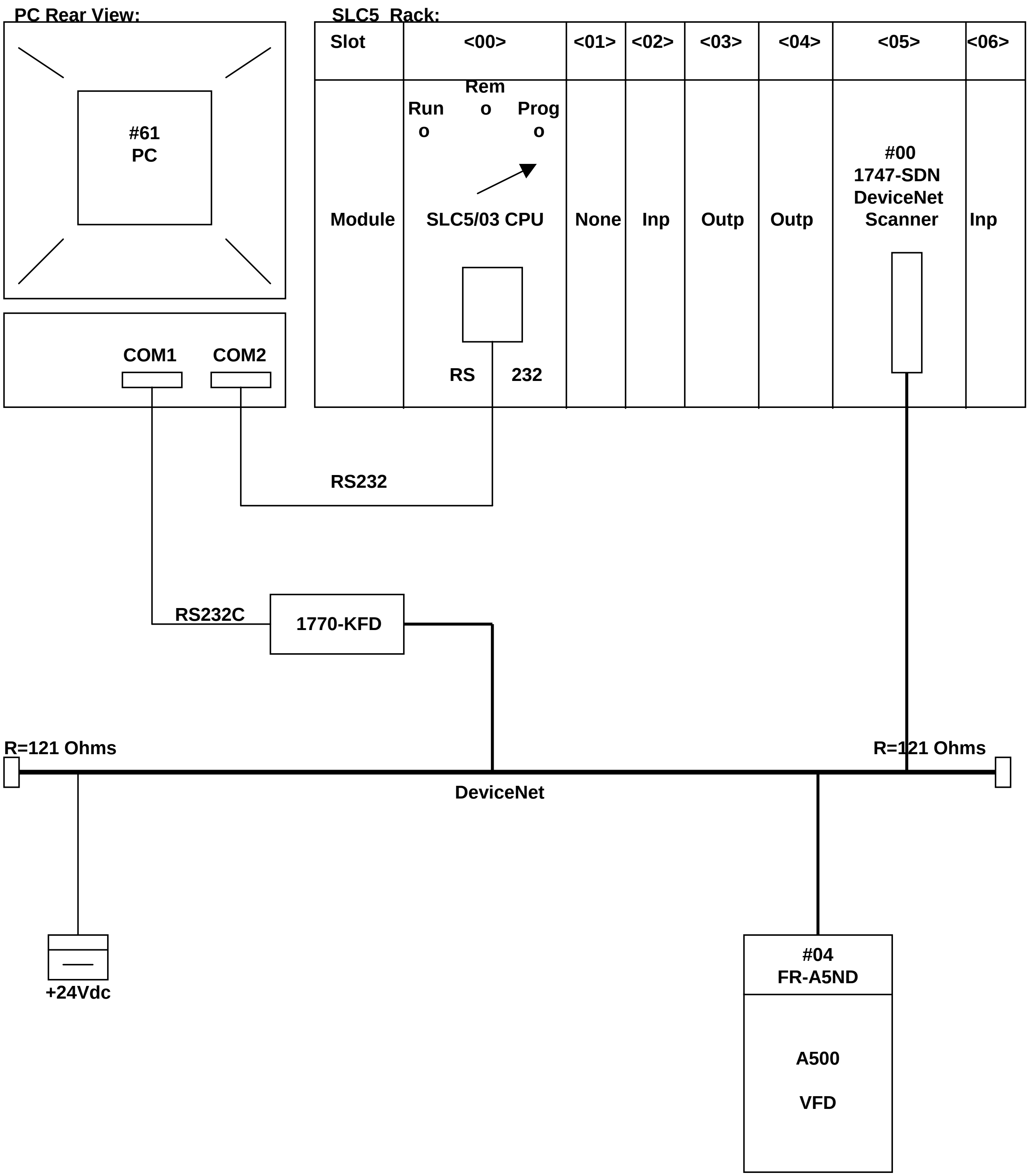
In both projects listed above, DeviceNet network of 1 node is actually present, node #04. These projects are available on disk or via email upon request. Follow instructions in the booklet, you can easily duplicate the projects by yourself to gain more hands-on experience on FR-A500 via FR-A5ND on DeviceNet. These projects are designed for demonstration purpose only. They are designed based on the current releases on A/B software programs RSNetWorx, RSLogix500 as of April 20th, 2000. In case of future releases of these software programs from A/B, many changes may be required to run these projects consequently. They can be used for reference only.

For any actual implementation, please consult your technical experts on how to set up your special application.

In the following sections, all drawings are not drawn to scale, they are drawn for illustration only.

4. Network Layout

4.1. Example of 1-Node Configuration



4.2. Explanations about Network Layout

- Set up A/B modules in rack:
  - **Slot <00>** SLC5/03 CPU, required
  - **Slot <01>** None, empty, optional
  - **Slot <02>** Input, optional
  - **Slot <03>** Output, optional
  - **Slot <04>** Output, optional
  - **Slot <05>** 1747-SDN Scanner, required
  - **Slot <06>** Input, optional

- **+24Vdc –** External power supply to DeviceNet network

- **#00 –** Node address for Master Scanner on DeviceNet network, #00 is selected for fast scanning, since scanning sequence starts from node #00 on scan list

- **#04 –** Node address for VFD A500 via FR-A5ND on DeviceNet network, #04 is selected for compatibility with other master PLC conventions and convenience to add more nodes

- **#61 –** Node address for PC on DeviceNet network, #61 is selected for initial configuration only

- Set VFD Baudrate to 500K by setting Pr346 = 20614

- Install a terminating resistor (121 Ohms) at each end of network

- Connect A/B 1770-KFD to network

- Connect A/B 1770-KFD to COM1 on PC via RS232C Cable
  (e.g. A/B PN96881501 with Null-modem built-in)

- Connect A/B RS232 (DF1) port on SLC5/03 CPU to COM2 on PC via RS232 Cable
  (e.g. A/B 1747-CP3, Ser.A, RS232 Cable)

- Set Key-Switch on SLC5/03 CPU to Prog-postion

- Install A/B RSLinx software program

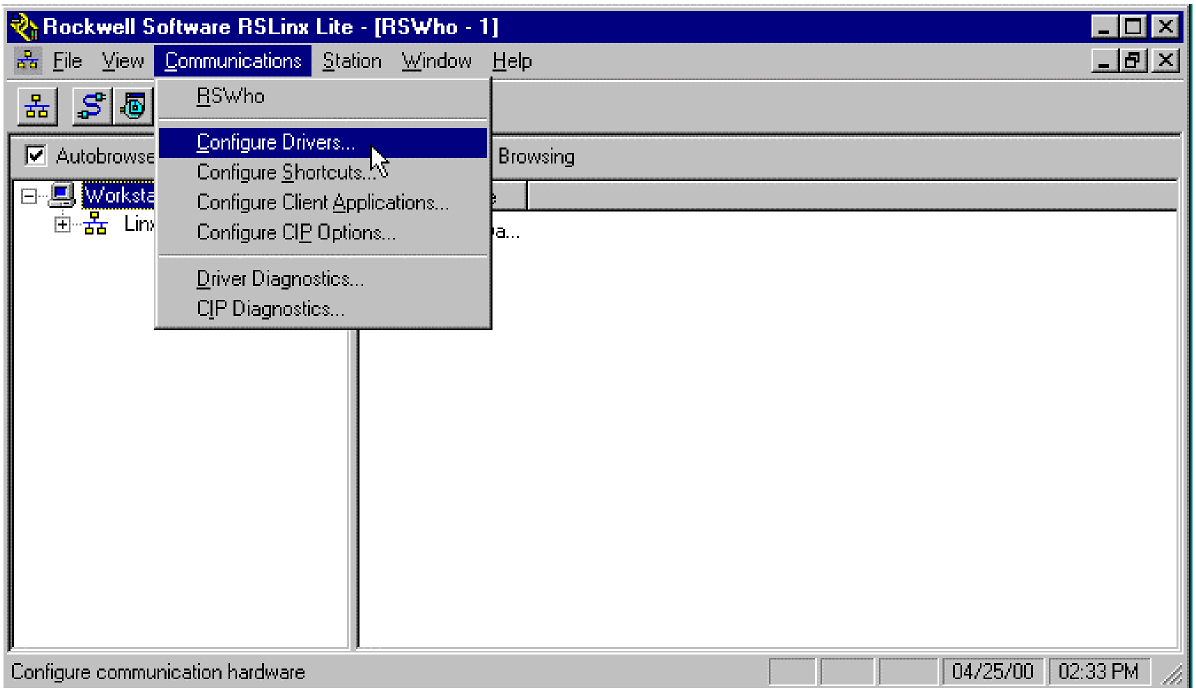
- Install A/B RSNetWorx software program

- Install A/B RSLogix500 software program

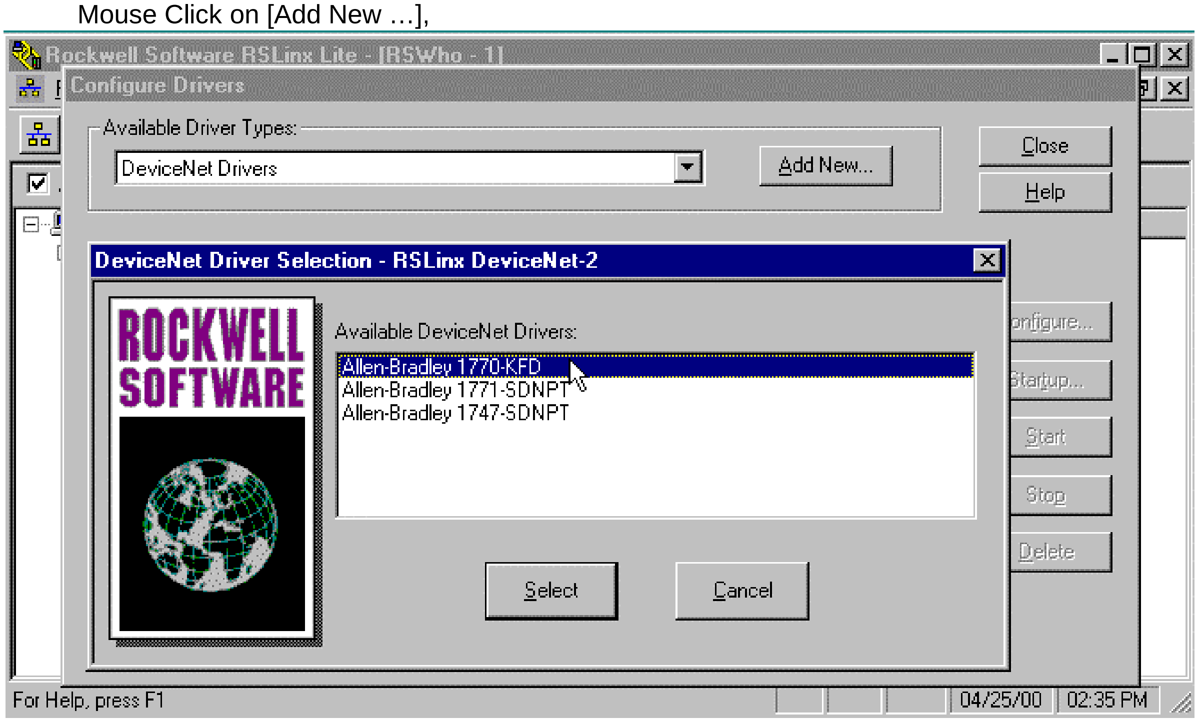
5. Configuring Drivers in RSLinx

5.1. Config DeviceNet Driver for RSNetWorx

Start RSLinx software program on PC,
Install DeviceNet driver as follows:

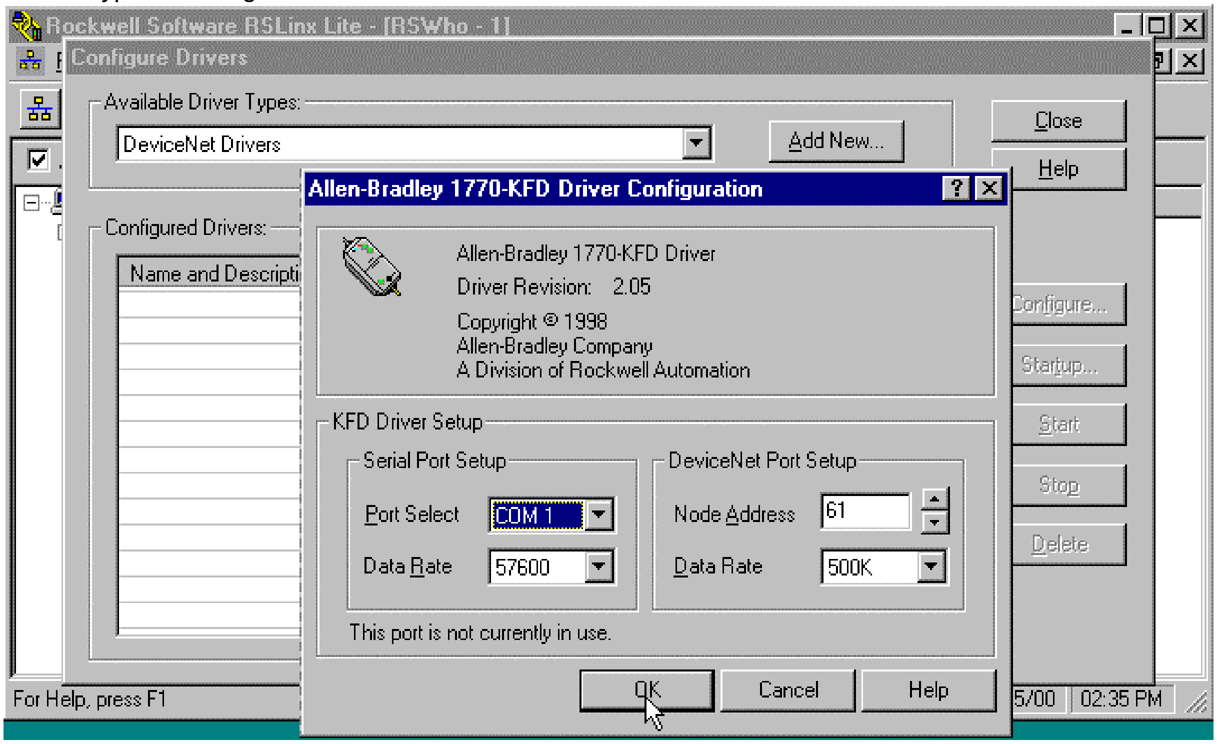


Choose DeviceNet Drivers for Available Drivers,
Mouse Click on [Add New …],



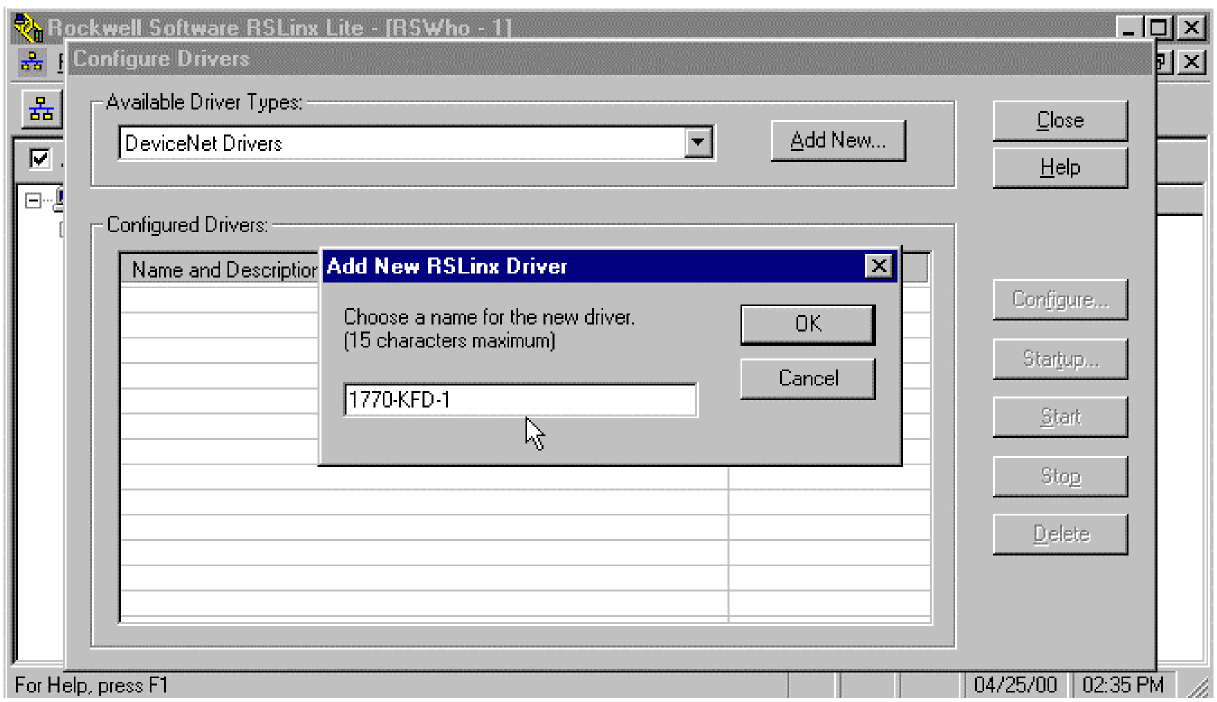
Choose A-B 1770-KFD,
Mouse Click on [Select]

Type in settings as follows:



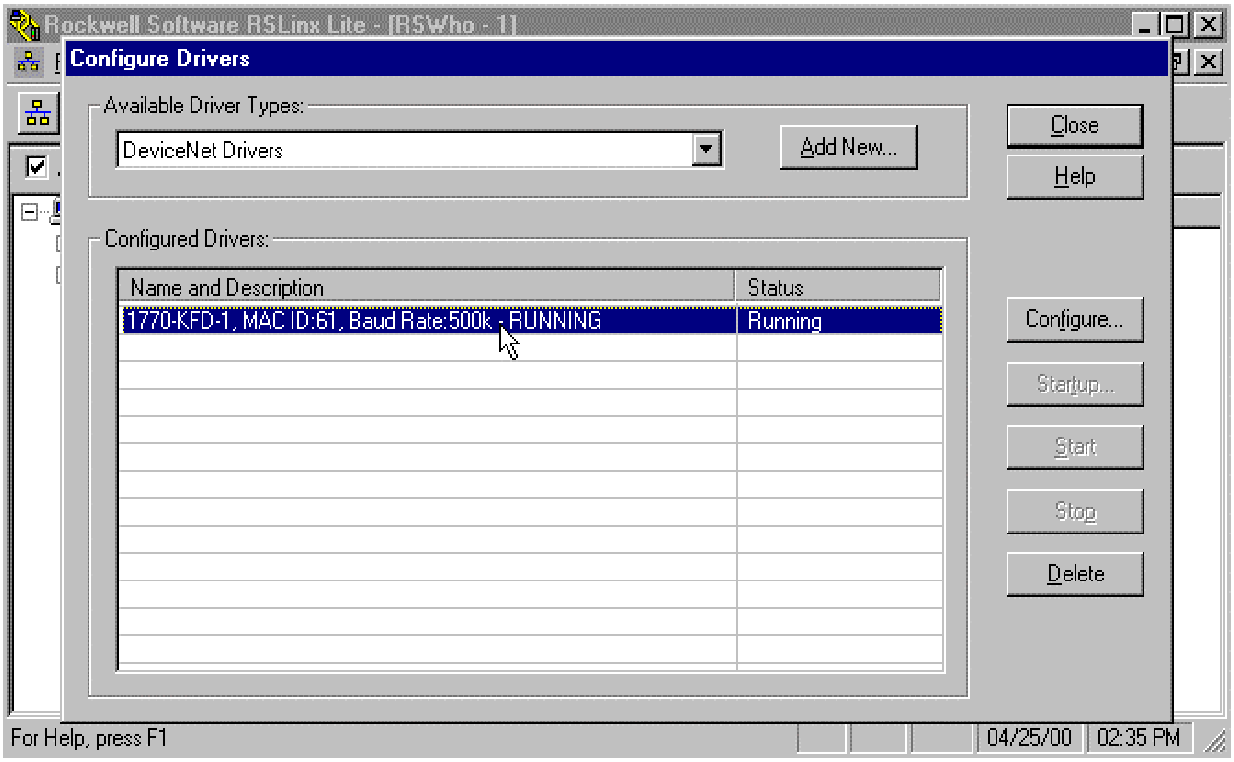
Mouse Click on [OK]

See new driver on screen:



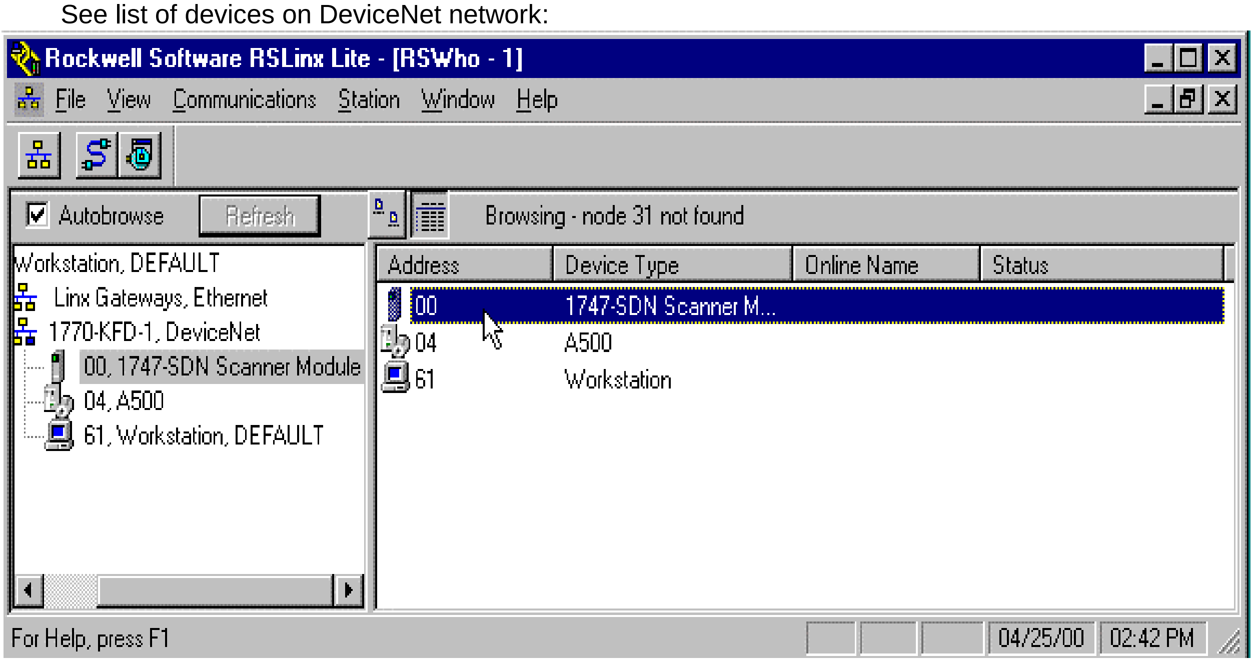
Confirm above screen,
Mouse Click on [OK]

See Configuration result:



Confirm above screen,
Mouse Click on [Close]

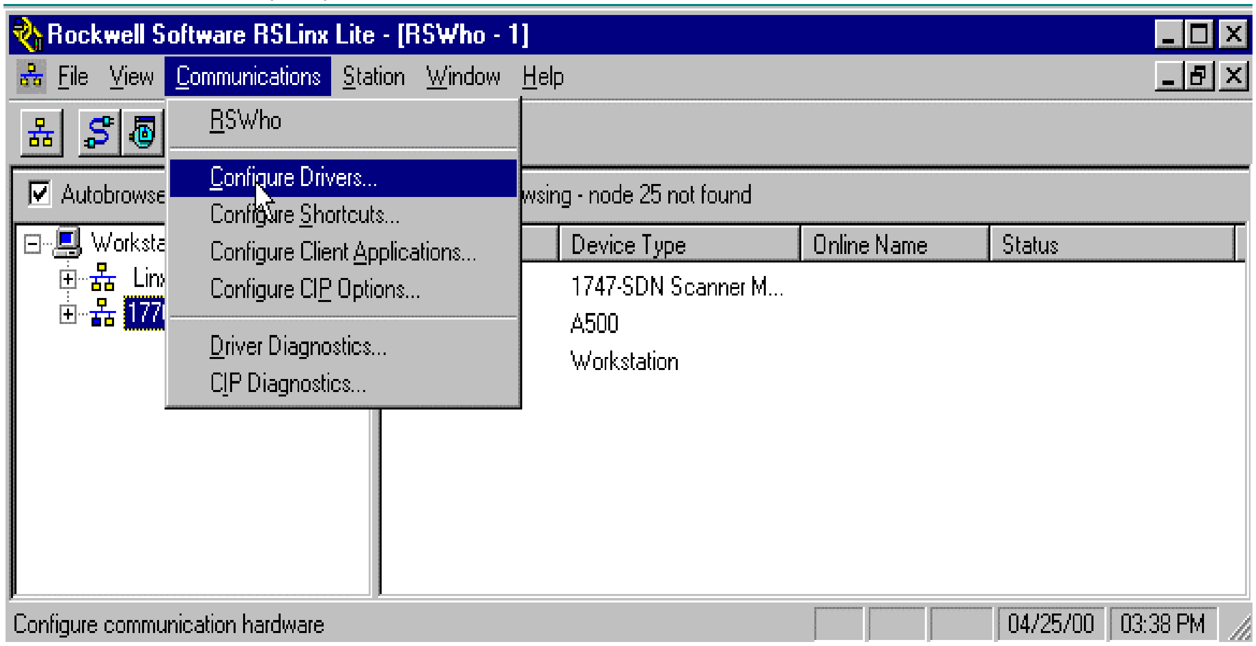
In Network Tree View, Select Driver**:** **"1770-KFD-1, DeviceNet"**
[v] Autobrowse is checked for activation,
See list of devices on DeviceNet network:



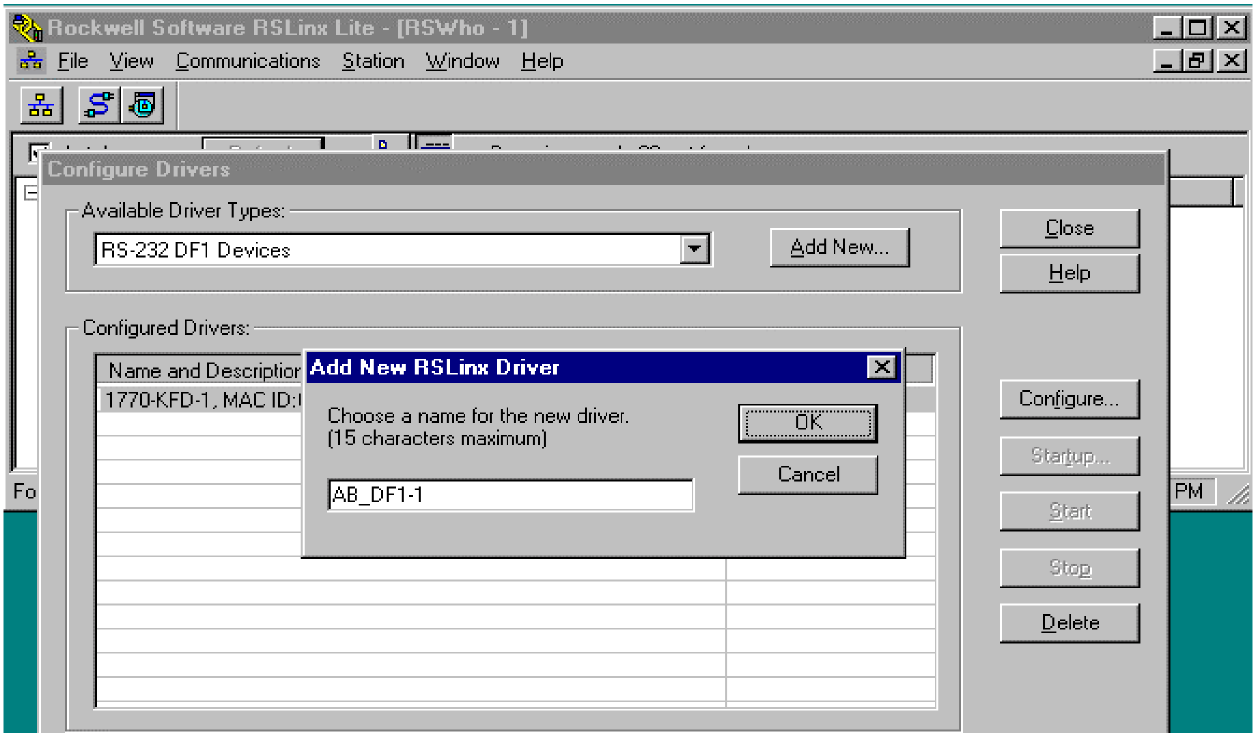
Confirm devices in above list
Verify FR-A500 PU displays Net-mode, FR-A5ND LED is solid green

5.2. Config RS232 (DF1) Driver for RSLogix500

Continue in RSLinx software program on PC,
Install RS232 (DF1) driver as follows:

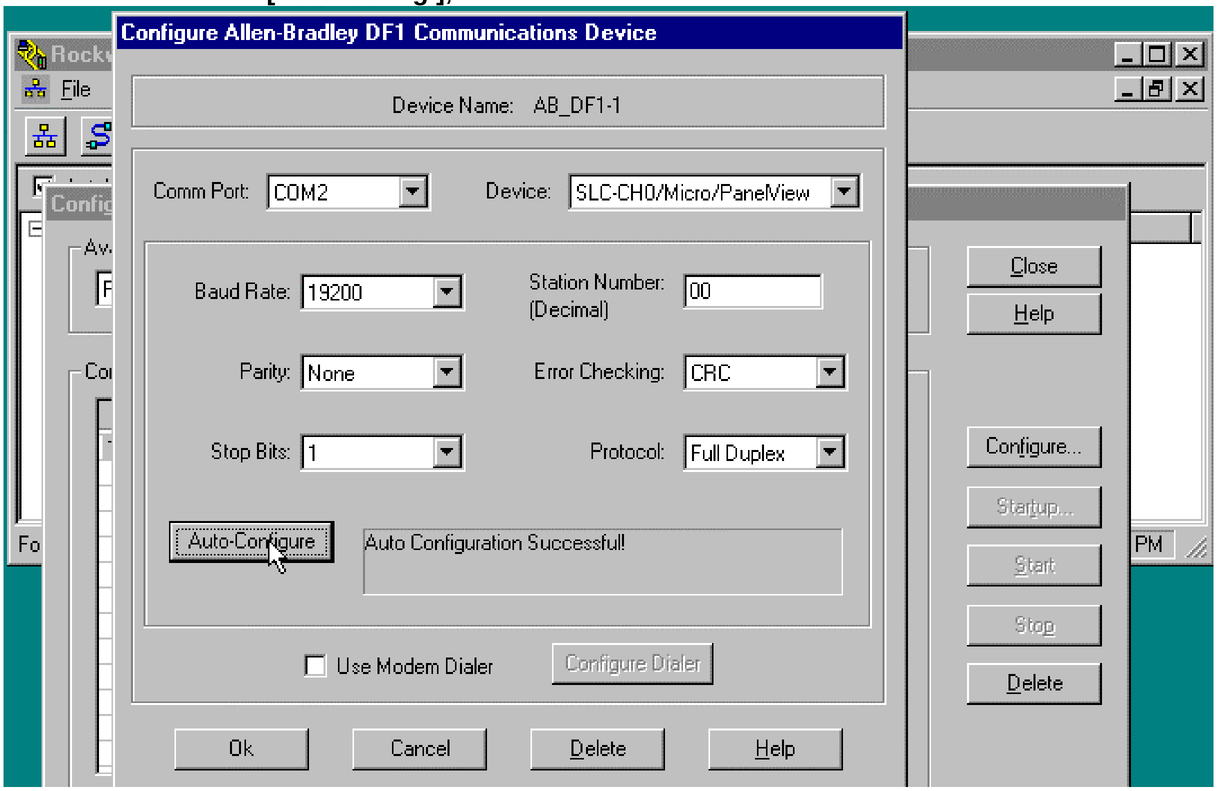


See next screen:



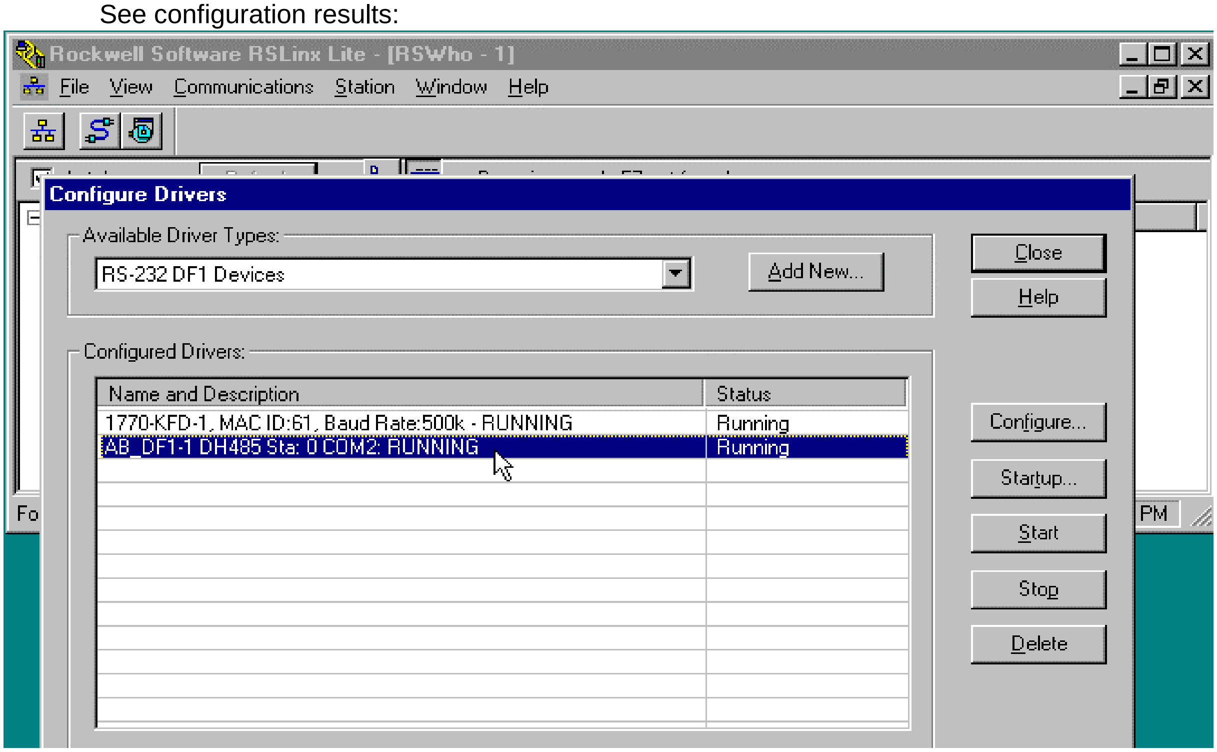
Choose RS-232 DF1 Devices for available drivers,
Mouse Click on [Add New …],
Confirm AB_DF1-1 for name,
Mouse Click on [OK]
Set next Key entry **COM2** for **Port** in table as follows,

Mouse Click on **[Auto-Config.],**



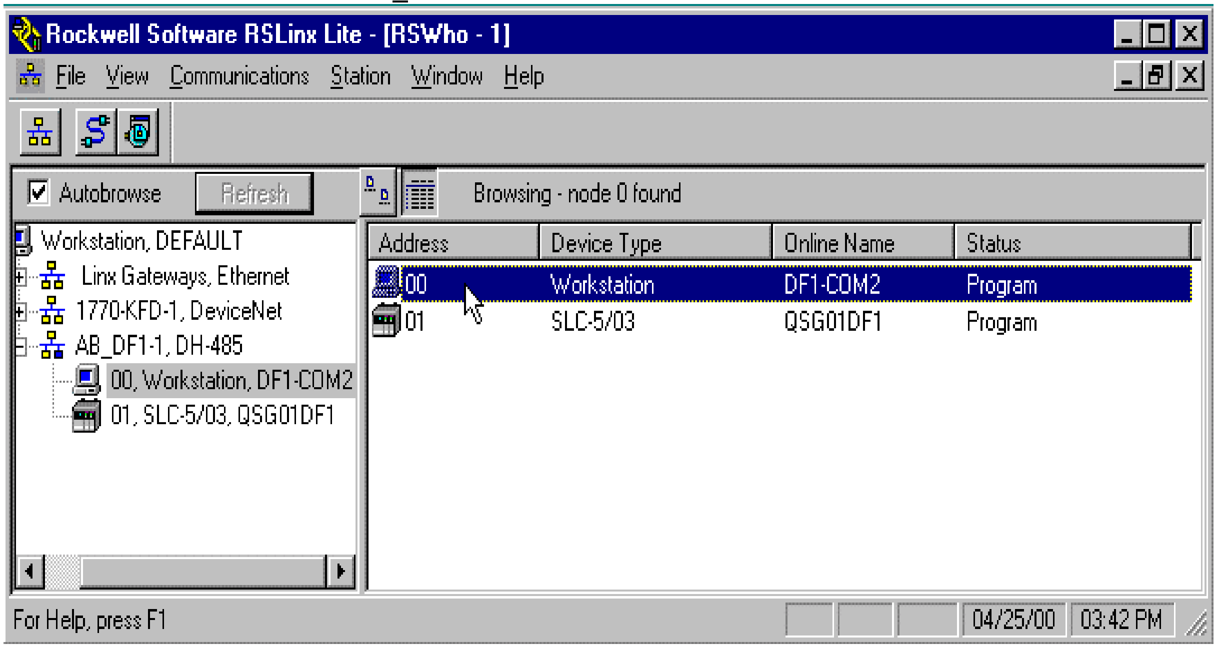
Confirm Auto Config Success in above table on screen,
Mouse Click on [OK]

See configuration results:



Confirm above screen, Mouse Click on [Close]
In Network Tree View,

Select Driver: **"AB_DF1-1, (DH485)"**
[v] Autobrowse is checked for activation,
See list of devices on AB_DF1 network



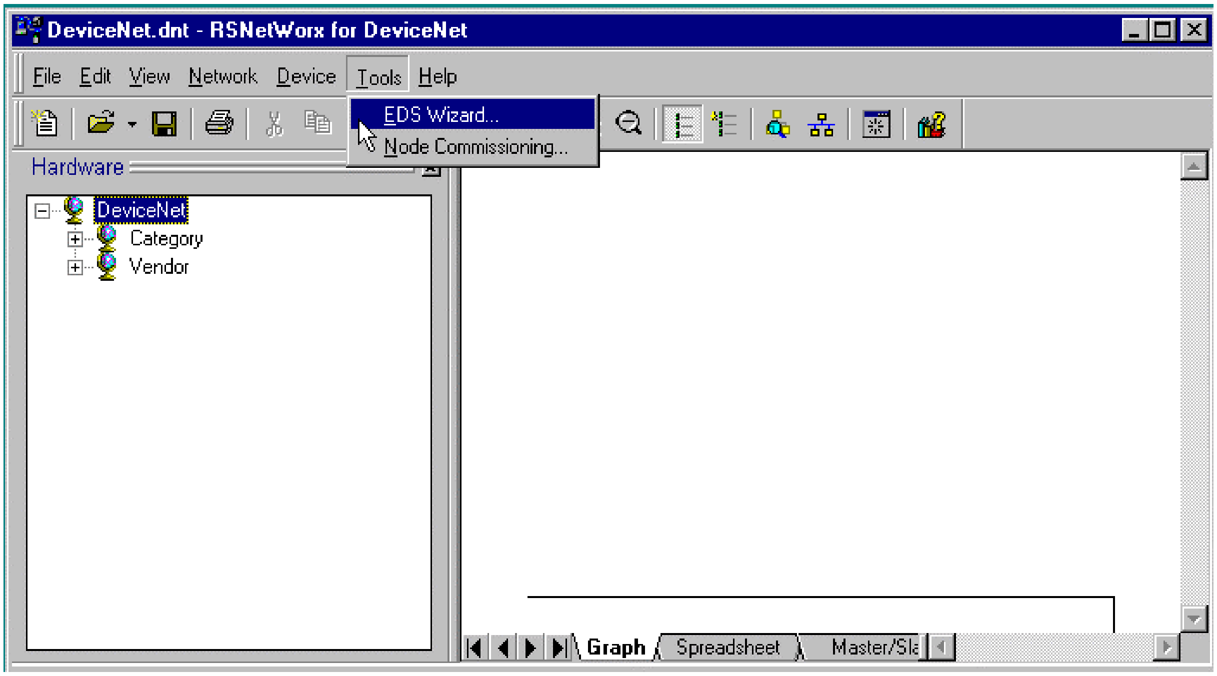
Confirm devices in above list
Verify RS232 LED on SLC5/03 CPU is blinking

Finally, minimize RSLinx Window to run both drivers on background

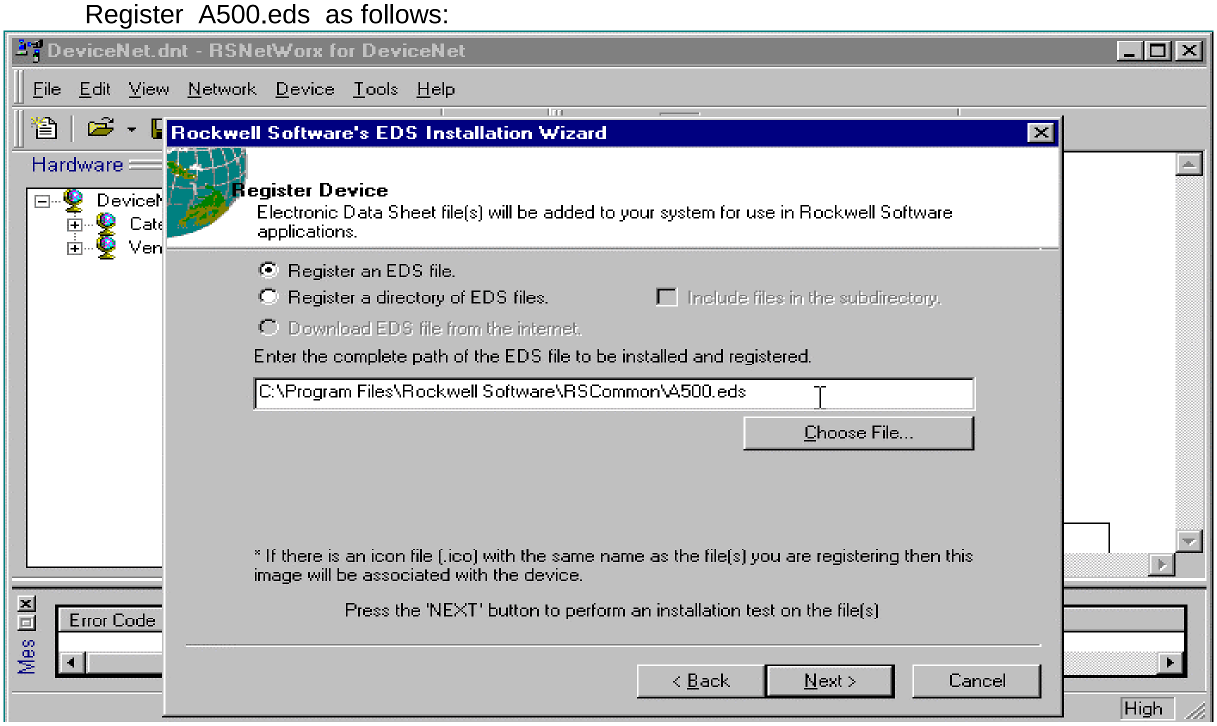
6. Configuring DeviceNet Network in RSNetWorx

Start RSNetWorx software program on PC,
Create Proj: **qsg_1747.dnt** in RSNetWorx,
Complete Proj as follows:

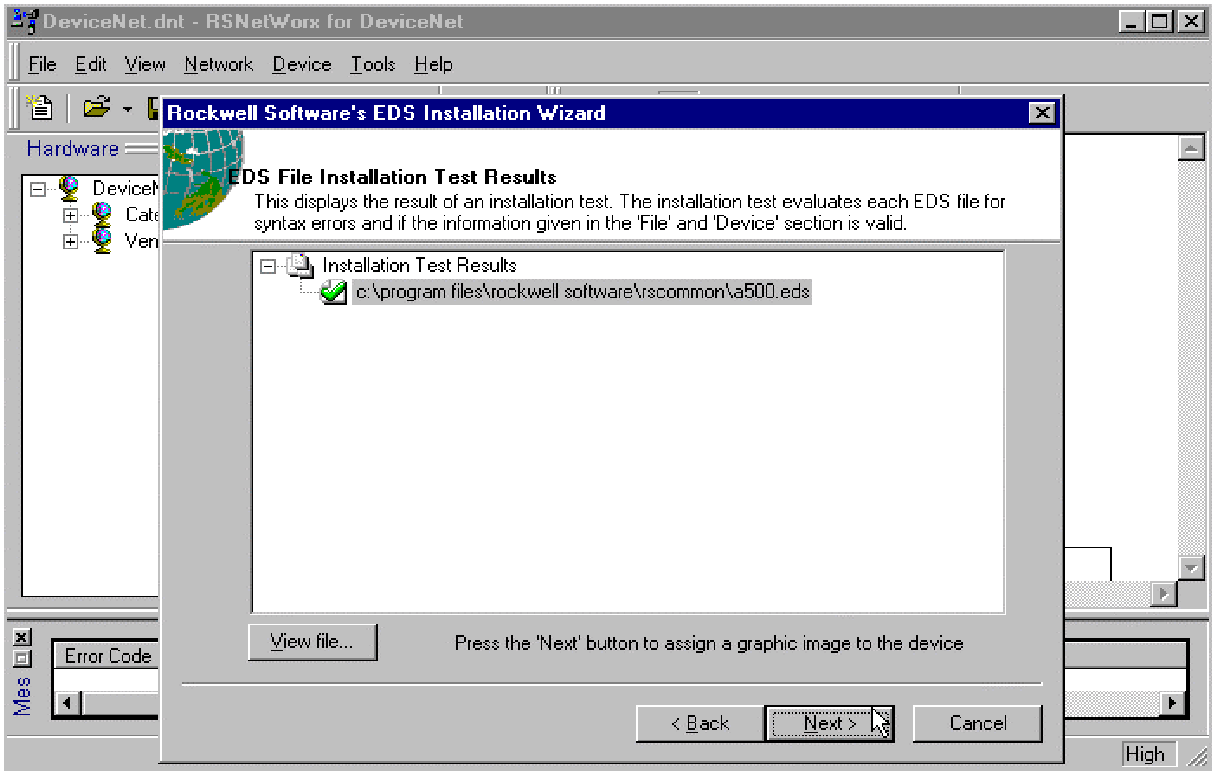
6.1. Installing A500.eds File



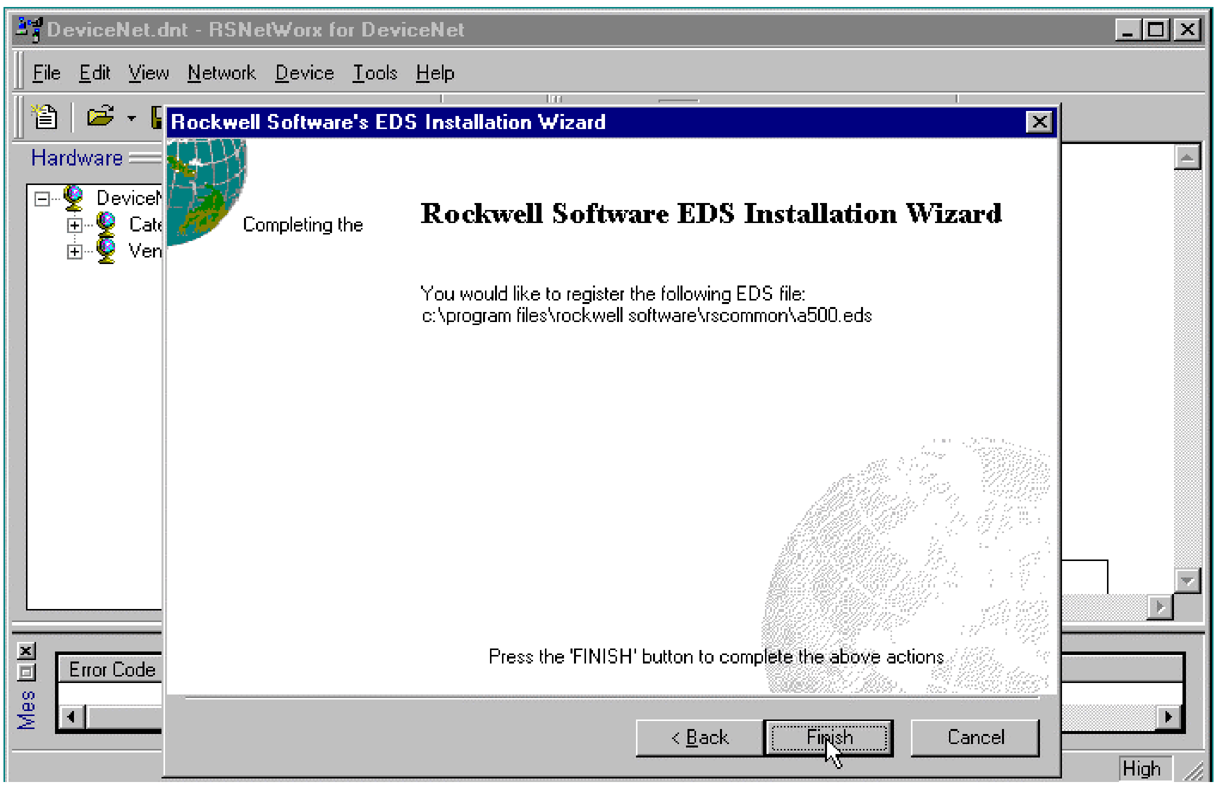
Register A500.eds as follows:



Mouse Click on [Next] to proceed as follows:

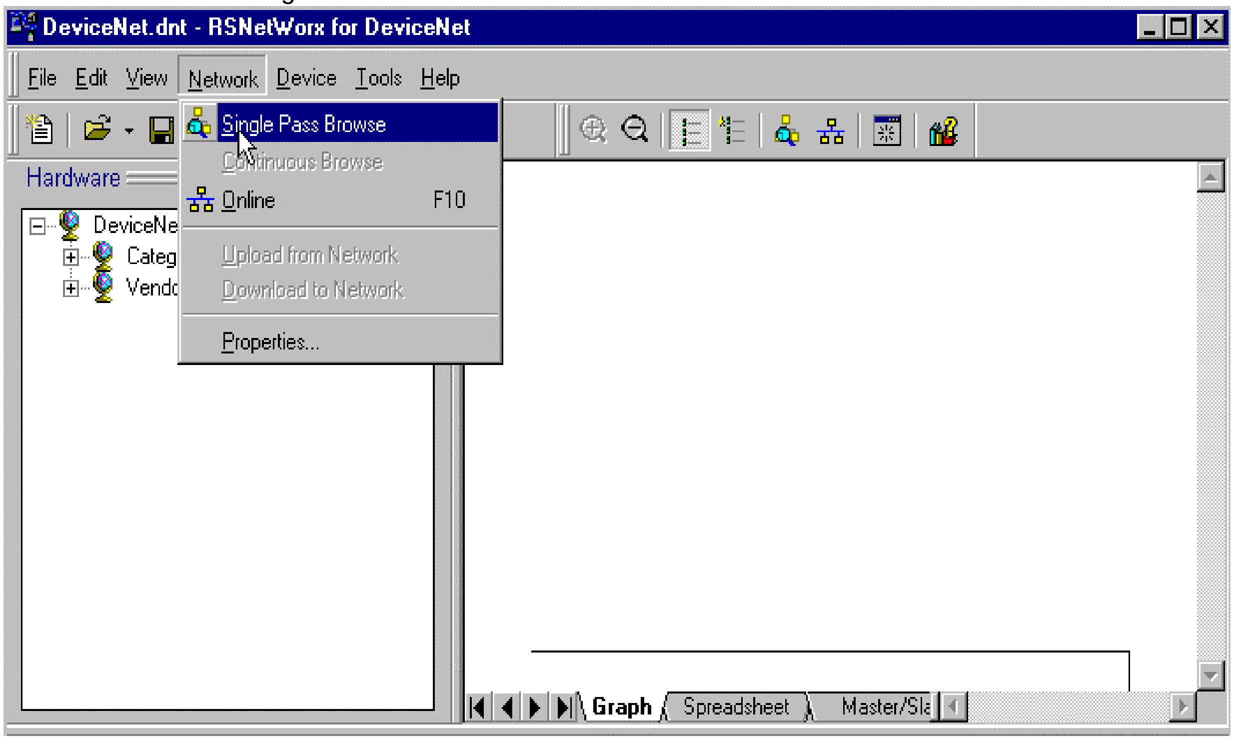


Mouse Click on [Next]:

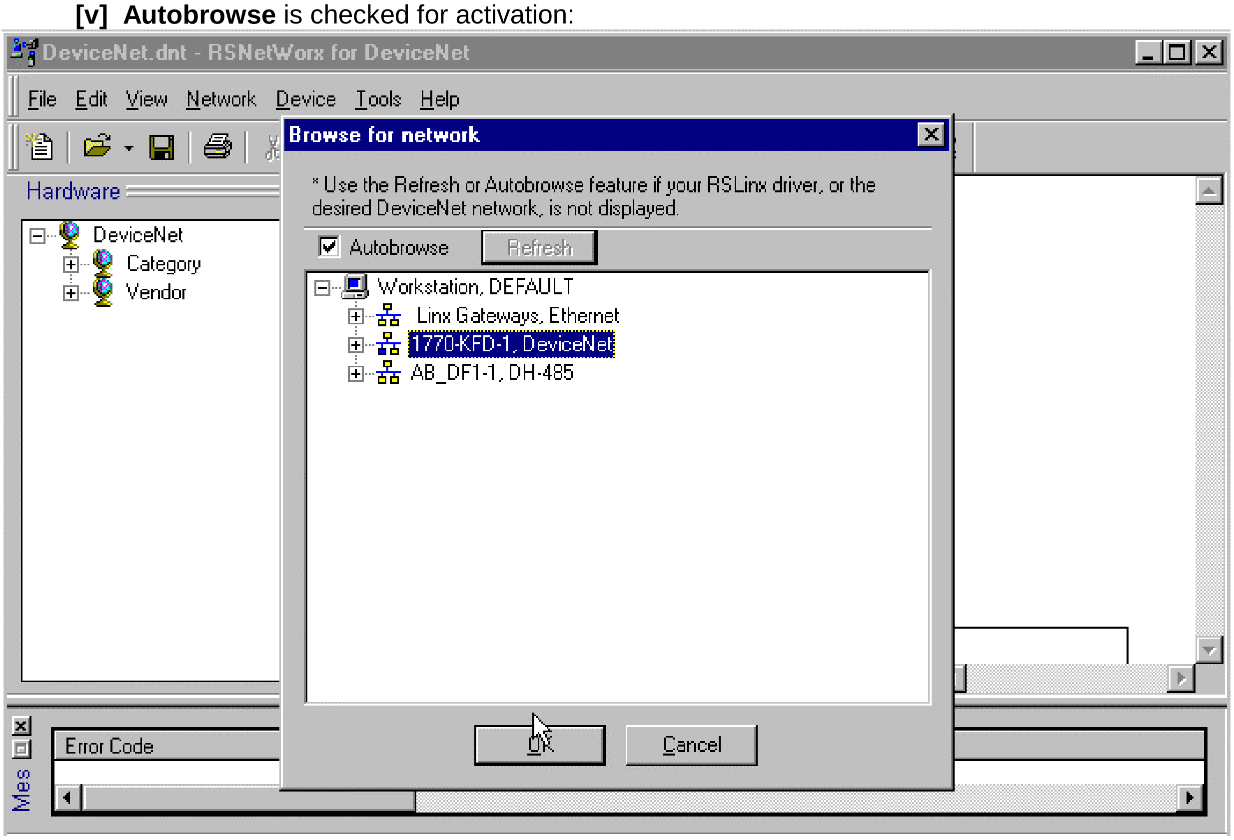


Confirm no errors during installation, if any, first verify correct version of A500.eds, Mouse Click on [Finish]

Continue with Single Pass Browse on Network:

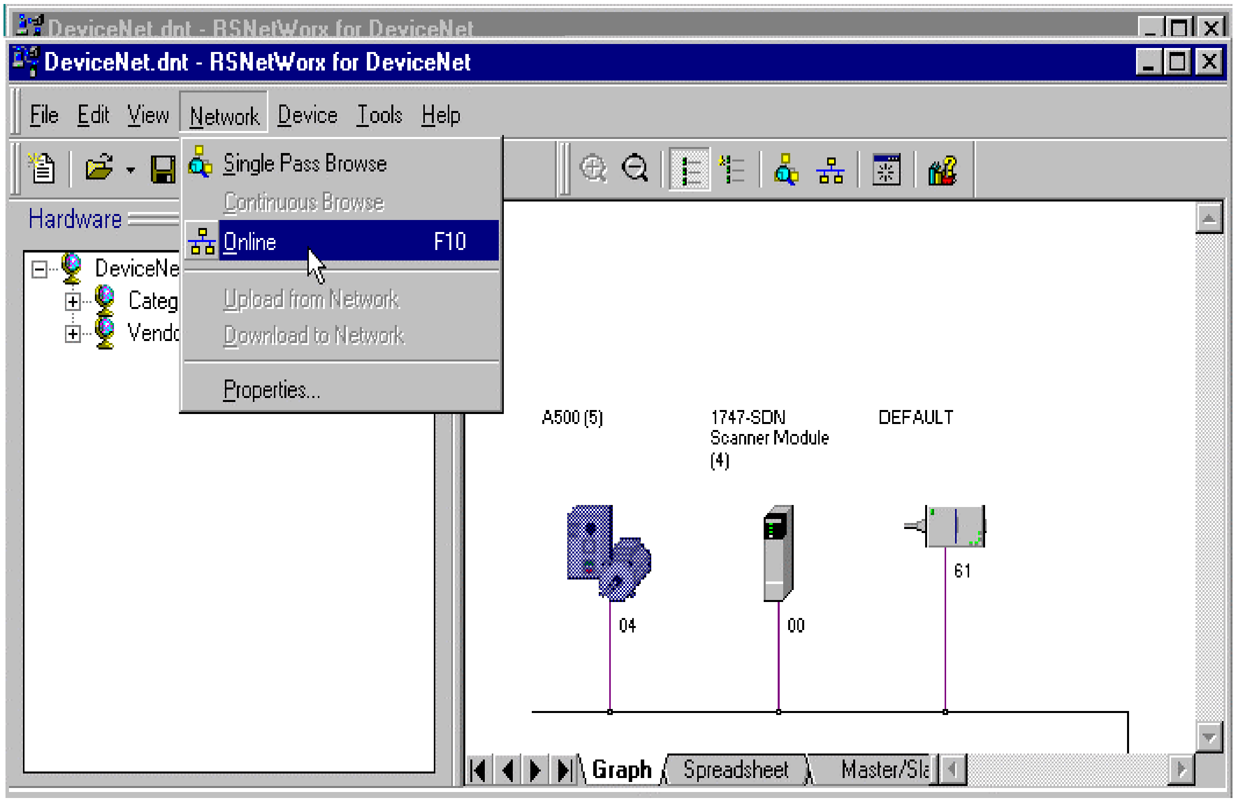


Select DeviceNet network with driver: 1770-KFD-1, DeviceNet,
[v] Autobrowse is checked for activation:



Mouse Click on [OK]

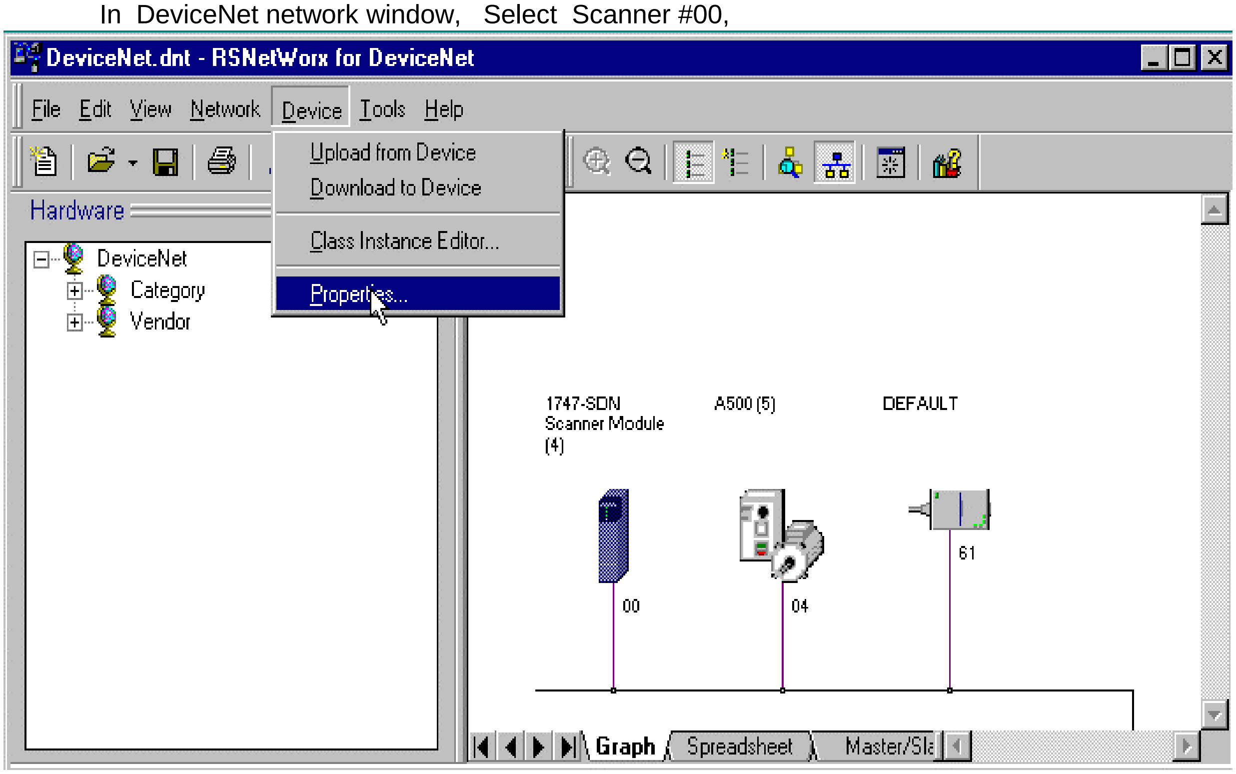
See next window for DeviceNet network on screen:



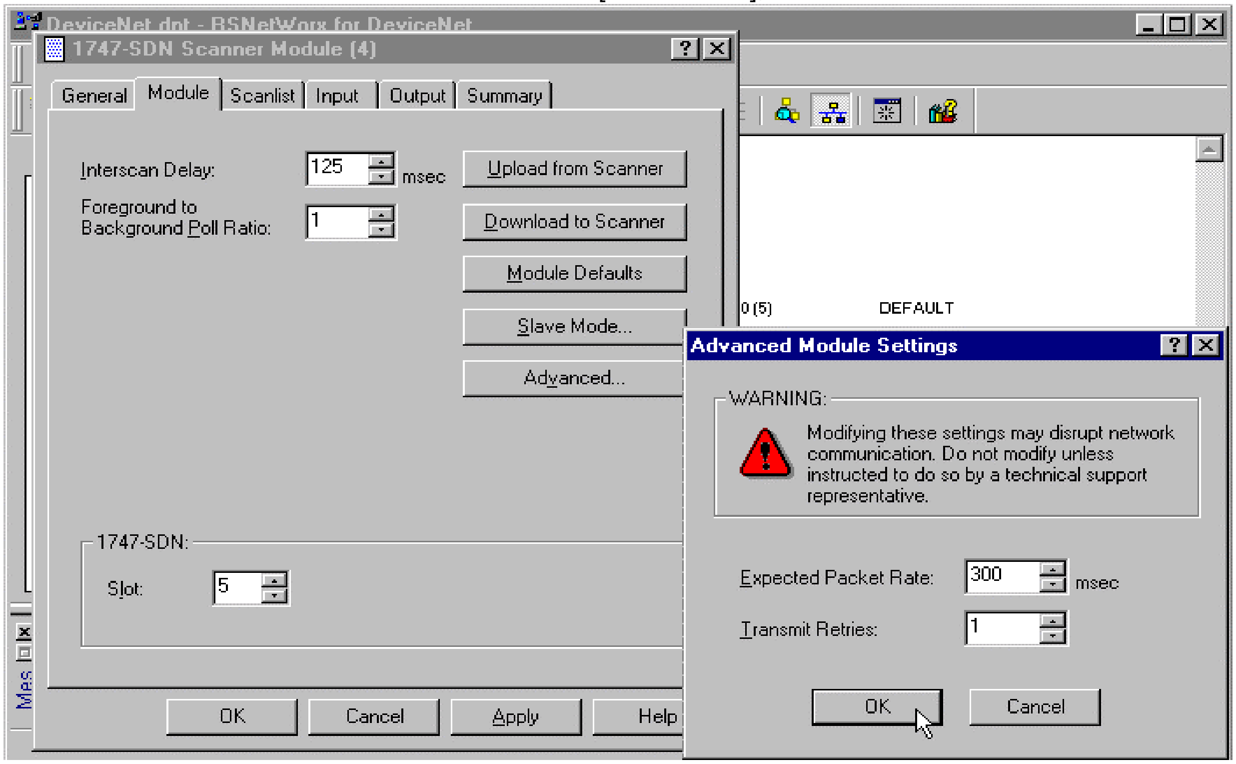
Now, FR-A500 via FR-A5ND is recognized by A-B Software.

6.2. Config Master Device 1747-SDN in Network Window Screen

In DeviceNet network window, Select Scanner #00,

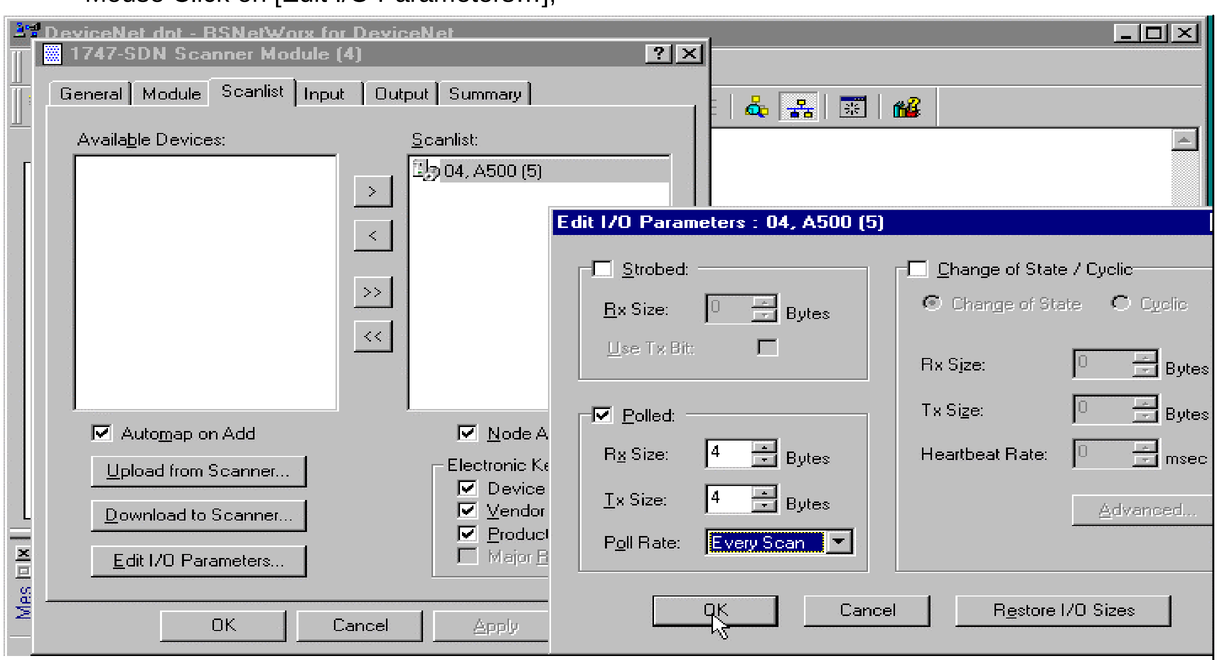


Select Tab: Module \ Mouse Click on [Advanced…], Set values as follows:



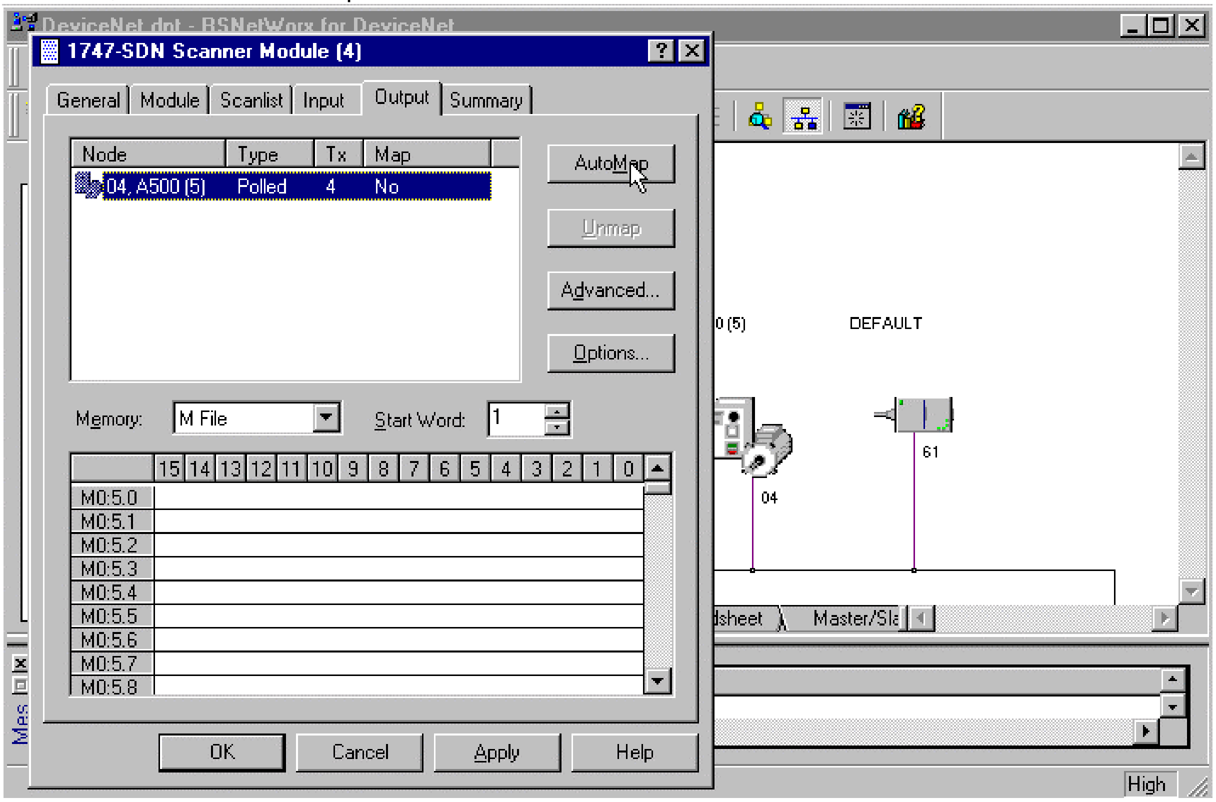
Note: Above timing values are set for this sample only, other values are acceptable as well.
Mouse Click on [OK] [Apply*]

Next Select Tab: Scanlist \
Select #04 from Available Devices window, move it to Scanlist window by Clicking [>],
Mouse Click on [Edit I/O Parameters…],

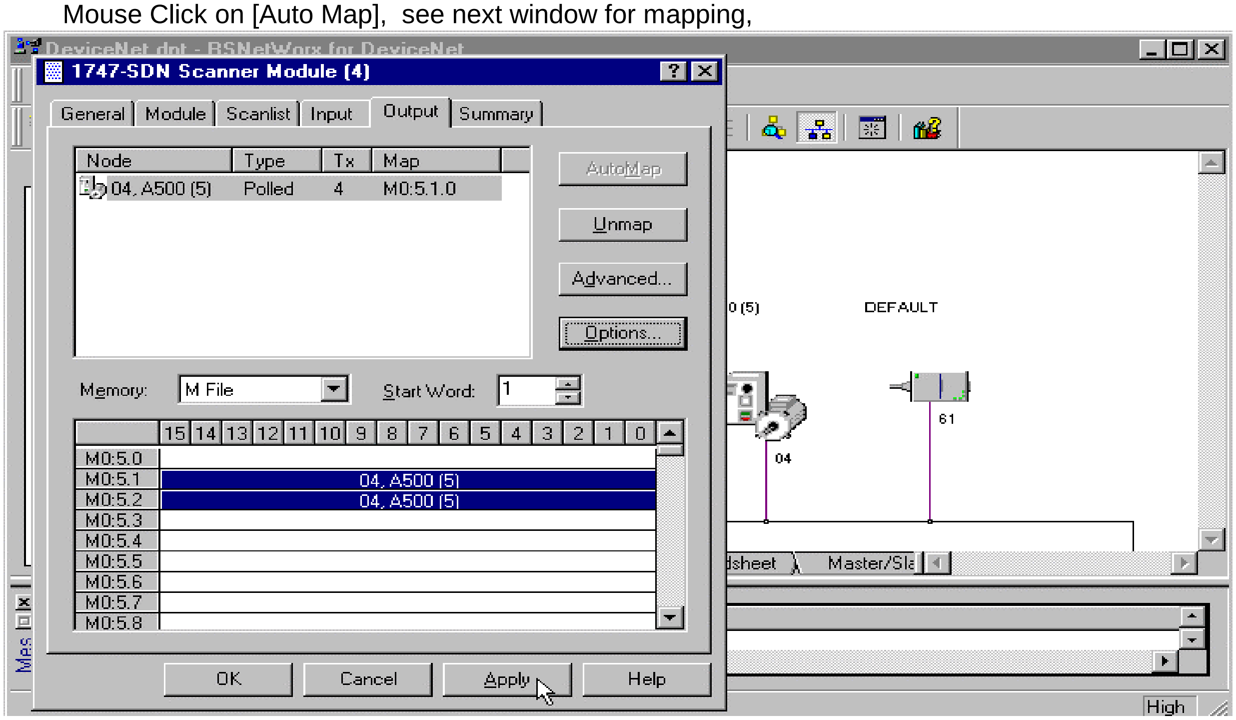


Confirm above screens, only [v] Polled is selected, Rx Size = 4, Tx Size = 4,
Since I/O Assembly Instances 21 / 71 are used for polling,
Mouse Click on [OK] [Apply*]

Now, Select Tab: Output \



Select M File for large proj, Set Start Word to 1, since W0 is reserved for SLC5/03,
Mouse Click on [Auto Map], see next window for mapping,

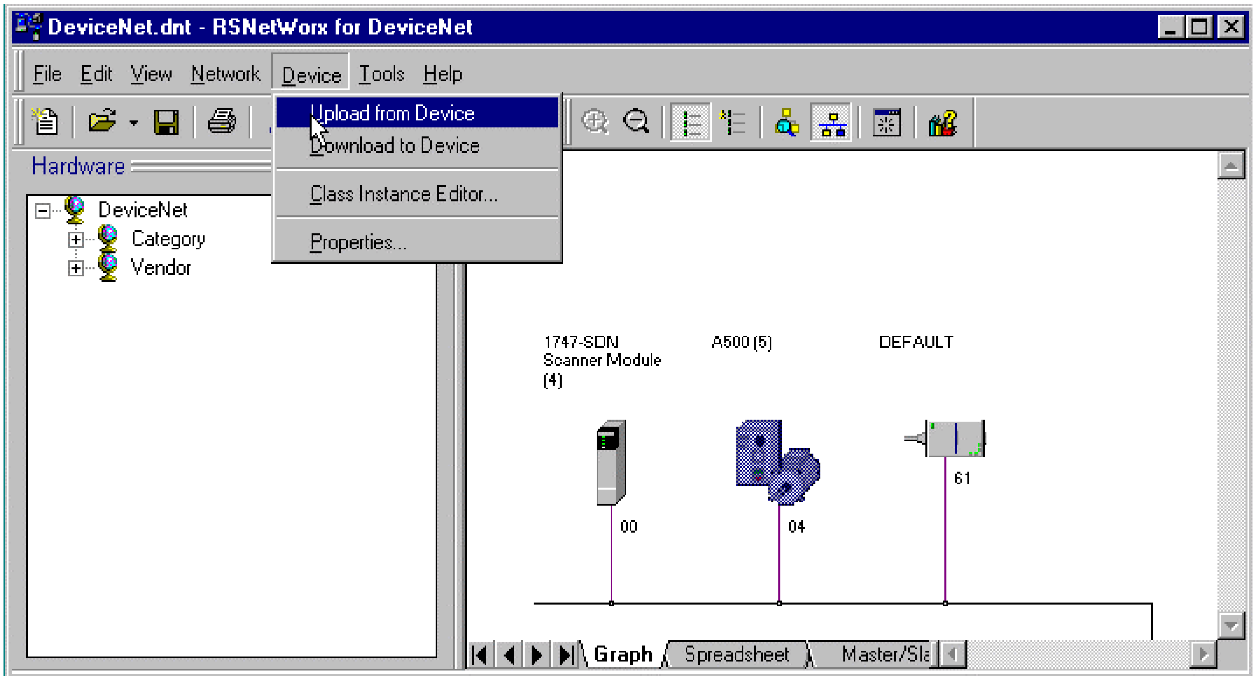


Note: M0:5:1 is B1^B0 in Output Instance 21, M0:5:2 is B3^B2 in Output Instance 21,
Mouse Click on [Apply*] [Yes] [OK]

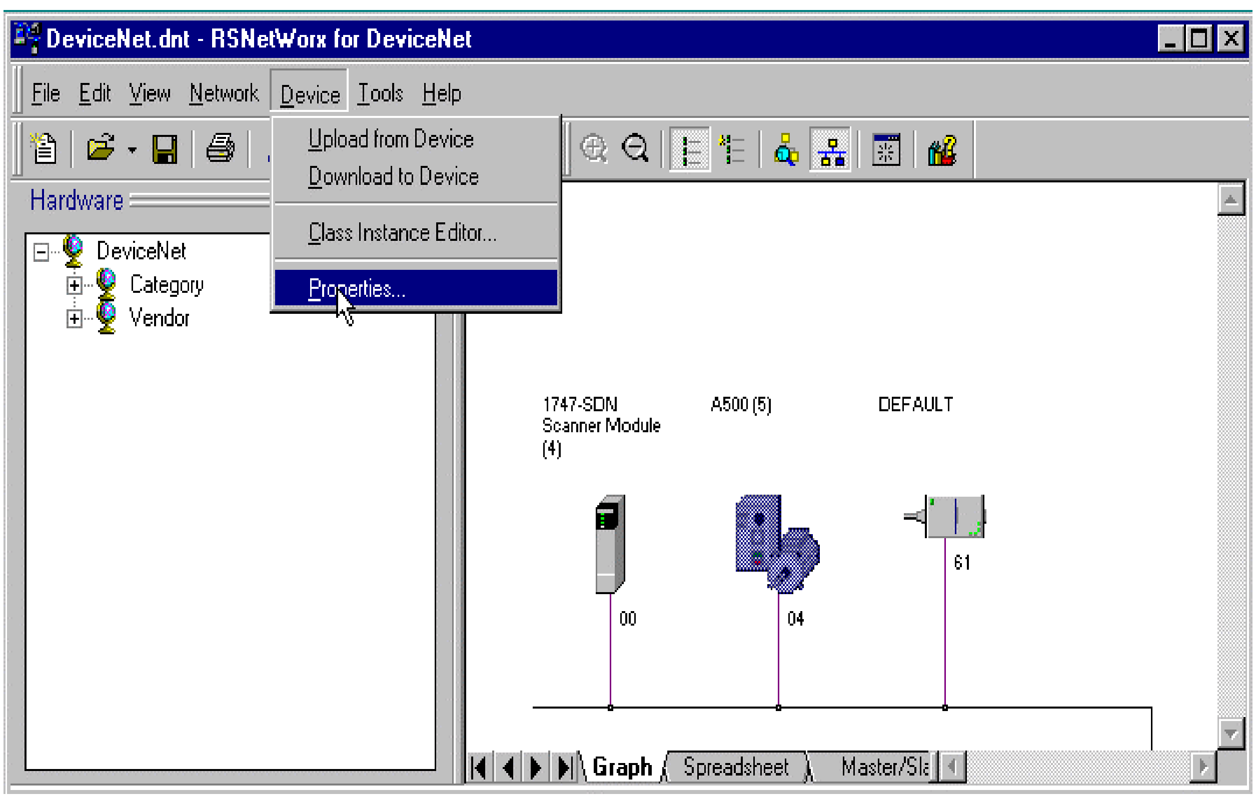
*: If FR-A500 PU displays “E.OP3”, this is normal, since network is reset, including Scanlist, etc.
Please press [RESET] button on PU or power cycle to VFD.

6.3. Config Slave Device A500 in Network Window Screen

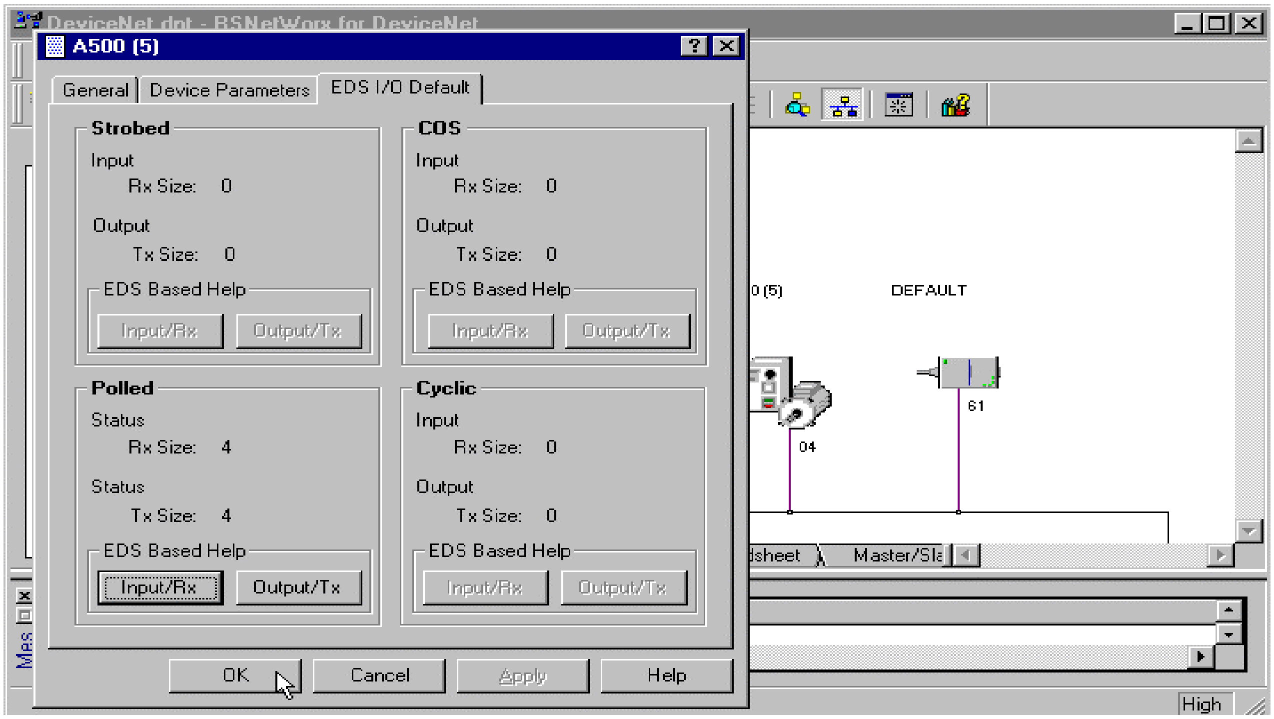
In DeviceNet network window, Select VFD #04,



Proceed as follows:

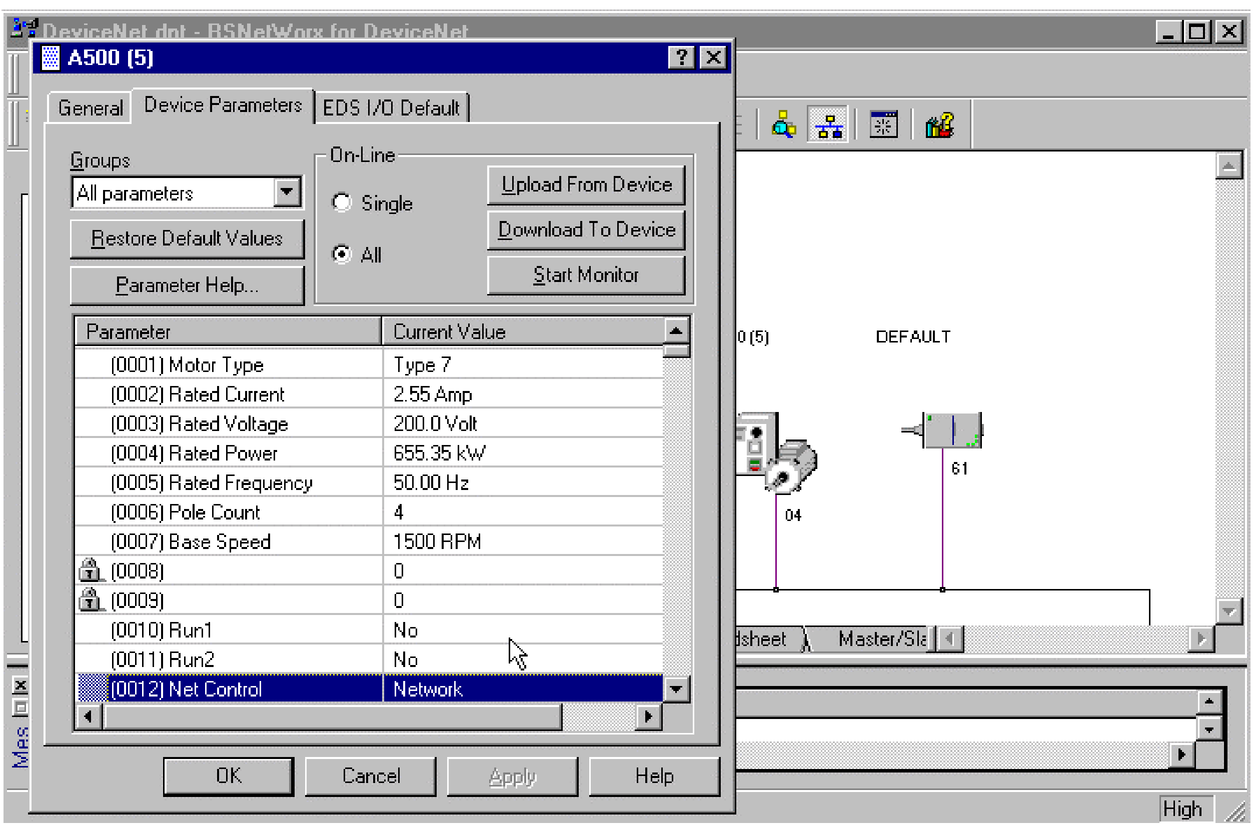


Select Tab: EDS I/O Default \

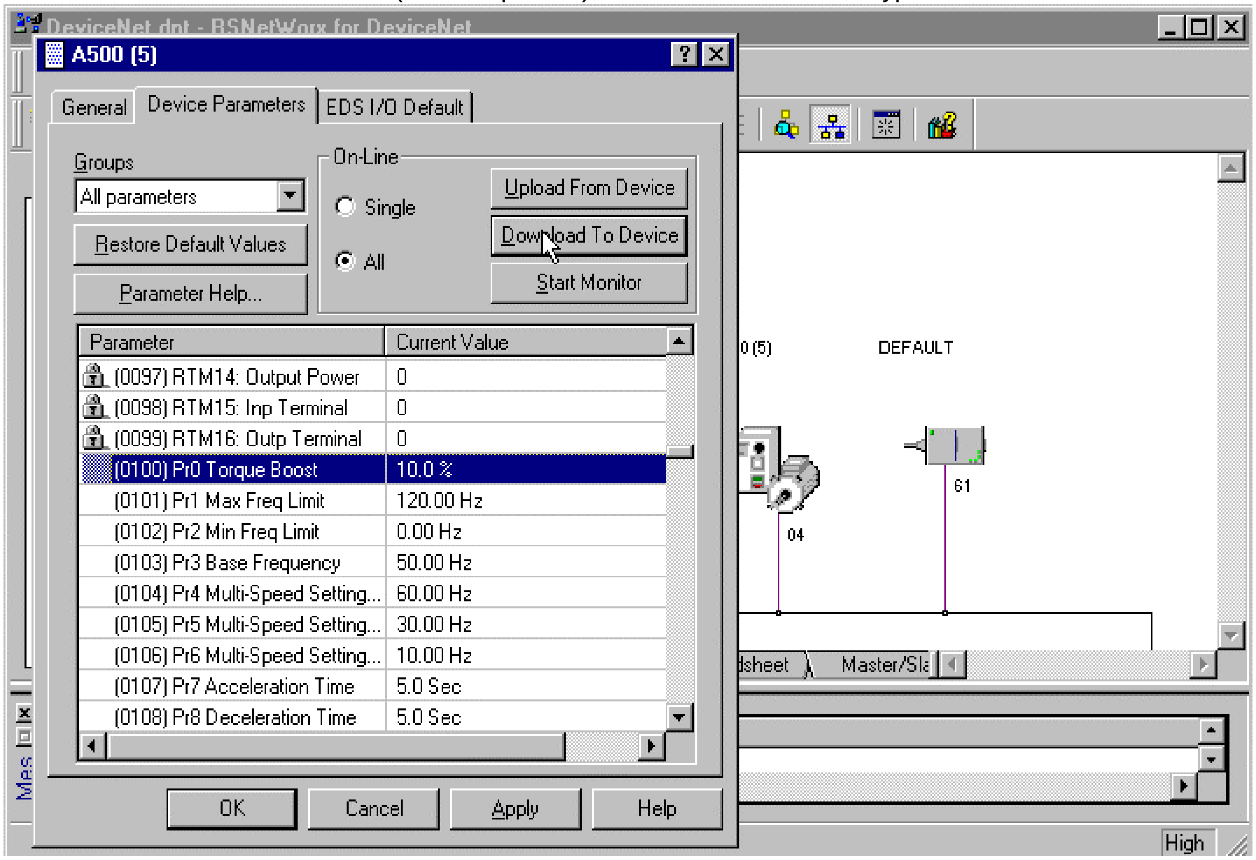


Confirm above screen, only Polled is enabled, Rx Size: 4, Tx Size: 4,
Since I/O Assembly Instances 21 / 71 are used for polling,

Next Select tab: Device Parameters \



Scroll down to EDS#0100 (Pr0 Torq Boost), Mouse D-Click on it, Type in a new value:



Mouse Click on [Download to Device],
If time-out happens, select [Retry].

Do File \ Save, Proj is done
Do File \ Exit, thus DeviceNet network configuration is complete.

7. Running VFD from SLC5/03 with RSLogix500

Create Proj: ***qsg_df1.rss*** in RSLogix500
Complete Proj as follows:

Make sure following items are ready:

- RS232 (DF1) port on SLC5/03 CPU is connected to COM2 on PC
- RS-232 (DF1) Driver for RSLogix500 is running on background of RSLinx

- **Please confirm the following important issues:**

Select Menu: Tools \

Select Sub-Menu: Options \ System Comms \ Enter settings as follows:

Driver	Node	Proc Name
AB_DF1-1	**[01]**	**Qsg_df1**

Note: Proc [01] is for AB_DF1, not DeviceNet

Mouse Click on [OK] [Yes] [Yes]

Confirm screen settings as follows

- No Forces
- Forces Disabled
- Tab \ User / Selected

Select Tree View: Proj \ Ctrlr \ IO Config \

Racks: See next table

1	**1746-A7 7-Slot Rack**
2	**I/O Rack Not Installed**

Obviously, only 1 Rack is on network

List of all modules in rack: See more details

# (Slot)	**Part# (A-B)**	**Descript**
0	1747-L532B	SCL5/03 CPU – 16K Mem, required
1	(Empty)	Nothing, optional
2	1746-IV16	16-bit Inp, optional
3	1746-OA16	16-bit Outp, optional
4	1746-OV16	16-bit-Outp, optional
5	1747-SDN	DeviceNet Scanner, required
6	1747-IA16	16-bit Inp, optional

Confirm above with actual modules in rack
Mouse Click on **[x]** to close window

Select Tree View: Data Files \

Select binary file: B3 – Binary Set bit-wise values as follows:

Offset	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
B3 : 0																
B3 : 1																
B3 : 2																
B3 : 3	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0
B3 : 4	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0
B3 : 5	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1

Note: Use Mouse R-B Click \ Toggle Bit **B3 : W / b**

Explanation for file: B3 – Binary Confirm functions as follows:

B3 : 3	**0x60**	NetCtrl, NetRef, STOP
B3 : 4	**0x62**	NetCtrl, NetRef, STR
B3 : 5	**0x61**	NetCtrl, NetRef, STF

These bit-maps are used in all polling applications for Assembly Object Output Instance 21, please refer to FR-A5ND Instruction Manual for more details.

Mouse Click on **[x]** to close window

Do next action

After completing editing

Download to SCL5/03 CPU

Confirm no errors

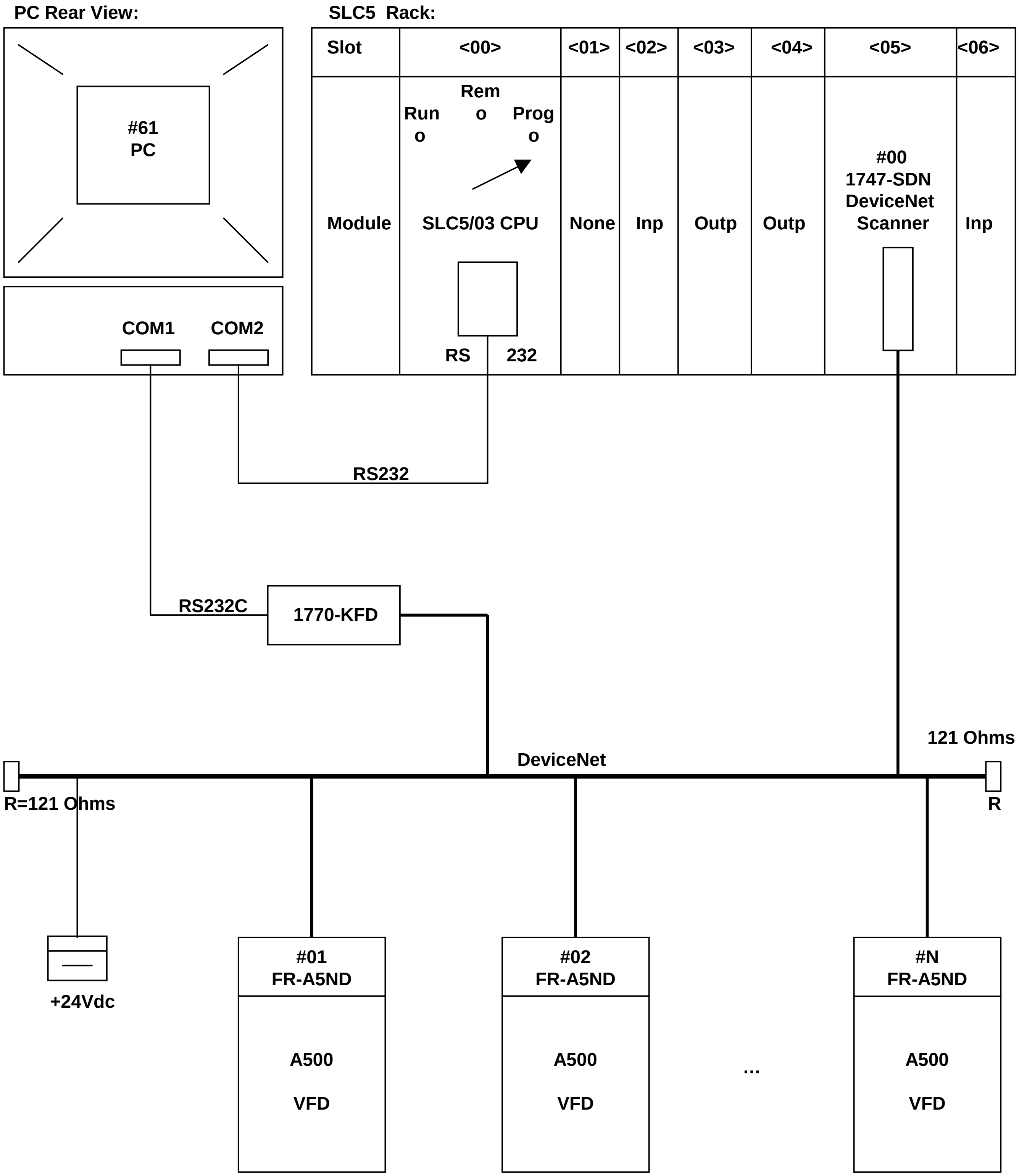
See PLC5/03 Rack

	<00>	**<01>**	**<02>**	**<03>**	**<04>**	**<05>**	**<06>**
Power	**Rem** **Run o Prog** **o o** **SLC5/03 CPU** **RS 232**	**None**	**Inp**	**Outp**	**Outp**	**1747-SDN DeviceNet Scanner**	**Inp**

- Set Key-Switch on SLC5/03 CPU to Run-postion
- VFD's run as expected

8. Considerations for Multiple VFD's

8.1. Example of Multi-Node Configuration



8.2. Many Issues to Consider for Multiple VFD's:

- 1 Resistor (121 Ohms, ¼ Watts, thin-film) at EACH end of trunk is needed
- Use 500 KBaud whenever possible
- Use Thick Trunk cable whenever possible
- Minimize Thin Drop cable whenever possible
- Avoid Daisy-Chain
- Always assign Sta.#00 to PLC
- Always assign Sta.#61 to PC
- DO NOT use Sta.#63, it's reserved for Default New Node
- Play with DeviceNet Assistant first, it's free from A/B
- Remember FR-A5ND using 50mA in DNet Assistant
- FR-A5ND uses 4 Byte I/O for Polling, Instances 21/71
- Map into 2 Words in Scanner
- Offline config first, default at #63, 125KBaud
- LED is Blinking Green?
- Do Node Commissioning
- Ready to go

References

- **Mitsubishi Electric**: FR-A500 Inverter Instruction Manual
- **Mitsubishi Electric**: FR-A5ND DeviceNet Option Instruction Manual
- **Rockwell Automation**: DeviceNet Assistant Software Program User Manual
- **Rockwell Automation**: RSLinx Software Program User Manual
- **Rockwell Automation**: RSNetWorx Software Program User Manual
- **Rockwell Automation**: RSLogix500 Software Program User Manual
- **Rockwell Automation**: SLC500 Controller & Accessories Instruction Manual
- **ODVA**: DeviceNet Specification